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10/584,698

05/25/2007

Christian Belouet

979-237

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01/05/2012

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EXAMINER

BELYAEV, YANA

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|---------------------------------------|--|
| Office Action Summary | Application No. 10/584,698 | Applicant(s) BELOUET ET AL. | |
| | Examiner YANA BELYAEV | Art Unit 1741 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1-14 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-14 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 7-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Regarding claims 7, 8, 10, 11, and 13, the phrase "preferably" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).
4. Claims 9 and 10 are rendered as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships is the relationship between "the plate" and the rest of the apparatus. For purposes of examination it is interpreted that the plate is the part of the slot which is perpendicular to the plane of the support.
5. Claim 11 is rendered as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationship is the relationship between "a disk" and the rest of the apparatus. For purposes of examination it is interpreted that the disk is incorporated into the plate (interpretation of the plate is given above).
6. Claim 12 is a dependant claims and is rejected for the same reasons as above.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1- 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 4520752 (Belouet hereinafter) in view of WO 01/04388 (Janoch hereinafter).

4. Regarding claims 1-3, 6, 7, 13, and 14, Belouet teaches a device (Fig. 4) capable of depositing a polycrystalline silicon layer (abstract) onto a plane, elongate, moving support having two longitudinal faces and two longitudinal side edges (4). The device comprises a crucible (1) containing a bath of molten silicon (col. 2, lines 15-16), said support capable of being dipped at least in part in the bath and to pass substantially vertically in its long direction through the equilibrium surface of the bath (Fig. 4), and two edge control elements (15 and 16), each edge control element maintained substantially vertically close to one of the two longitudinal

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side edges (Fig. 4) so that the level of the bath raises over each longitudinal face of the support (col. 3, lines 1-9), each edge control element defining a longitudinal slot beside the corresponding longitudinal side edge (col. 2, lines 59-62), each slot being dipped in part in the bath so as to raise the level of the bath by capillary in the vicinity of the corresponding longitudinal side edge (col. 3, lines 1-4).

5. However, Belouet does not explicitly state that each edge control element is comprised of walls, wherein at least one of the walls, facing part of one of the longitudinal faces, is substantially plane.

6. Janoch teaches depositing a layer based on crystalline silicon onto a support (abstract), wherein the apparatus comprises edge control elements, each of which is comprised of walls defining a longitudinal slot beside the corresponding side edge, wherein the longitudinal slot is interpreted by the examiner to be formed by (84) in Figure 3C, wherein the walls forming the slot are substantially plane and parallel (Fig. 3C). Janoch also discloses that the crucible has a bottom and side walls (82, Figure 3c). It is interpreted that each of the edge control elements is stationary and held vertically by the bottom and forming a monolithic structure with the bottom, since in the embodiment disclosed in Figure 3b, Janoch states that walls (72) can be machined into the crucible (71) or can be separate pieces that are pinned to blind holes in the bottom of the crucible (71) (page 11, lines 10-11), or in the alternative, it would have been obvious for one of ordinary skill in the art at the time of the invention to have made the edge control elements stationary and held vertically by the bottom and forming a monolithic structure with the bottom, since Janoch discloses this configuration for a similar embodiment of the invention disclosed by

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Janoch. Janoch further teaches that each edge control element is made of graphite (page 10, lines 10-11), which presents emissivity greater than the emissivity of silicon.

7. It would have been obvious for one of ordinary skill in the art at the time of the invention to have replaced the edge control element configuration of Belouet with the edge control element configuration of Janoch. The motivation to do so would have been the rationale that the edge control elements are specially shaped structures which are designed to control meniscus height at the edges of the ribbon, wherein control of the meniscus at the ribbon edge can be affected by the specific design and placement of the structures (page 2, lines 12-21).

8. Regarding claims 4, 5, and 8, Belouet does not explicitly disclose the mean depth of the slot or the mean spacing between the insertion walls, however Belouet does disclose that the edge control elements are disposed relative to the edges of the tape so as to obtain a crystallization isothermal which is rectilinear across the full width of the tape. It is possible to control the degree to which the liquid silicon rises up the channels by capillary action by varying the channel inside diameter or the distance and orientation of channels relative to the edges of the tape (col. 3, lines 5-15). Thus, it is interpreted that the depth, spacing, and size of the orifice is a result effective variable, based on the dimensions of the support and the degrees to which the liquid silicon rises up the channels by capillary action, which it would have been obvious for one of ordinary skill in the art at the time of the invention to have optimized.

9. Regarding claims 9, 11, and 12, Belouet teaches that each of the edge control elements comprises a plate (15 and 16) which includes the slot (the channel inside 15 and 16), the plate being brought into contact with the equilibrium surface of the bath (Fig. 6). Belouet does not explicitly disclose the mean spacing between the insertion walls or the effective diameter of the

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slot, however Belouet does disclose that the edge control elements are disposed relative to the edges of the tape so as to obtain a crystallization isothermal which is rectilinear across the full width of the tape. It is possible to control the degree to which the liquid silicon rises up the channels by capillary action by varying the channel inside diameter or the distance and orientation of channels relative to the edges of the tape (col. 3, lines 5-15). Thus, it is interpreted that the mean spacing and effective diameter of the slot is a result effective variable, based on the dimensions of the support and the degrees to which the liquid silicon rises up the channels by capillary action, which it would have been obvious for one of ordinary skill in the art at the time of the invention to have optimized.

10. Regarding claim 10, Belouet teaches that contact with the surface of the bath takes place by means of a connection from the plate (17 and 18), however, Belouet does not explicitly disclose that the connection is attached to a displacement means external to the crucible.

However, Belouet states that it is possible to control the degree to which the liquid silicon rises up the channels by capillary action by varying the channel inside diameter or the distance and orientation of channels relative to the edges of the tape (col. 3, lines 5-15). Since the location of the control element is an orientation of the control element, it is interpreted that it would have been obvious for one of ordinary skill in the art to have modified the location of the control element to control the degree to which the liquid silicon rises up the channels by capillary action. It would have been obvious for one of ordinary skill in the art at the time of the invention to have done this by an actuator connected to the connection.

Response to Arguments

11. Applicant's arguments with respect to the 35 U.S.C. 112 rejections filed on 29 September 2011 have been fully considered but they are not persuasive.

12. The Applicant argues, regarding claims 9 and 10, that the relationship between "plate" and the rest of apparatus is clear since claim 9 defines "...a plate including the slot..." with the slot being defined in claim 1. Thus, the structural connections, including the plate, are defined in the present claims. See for example, page 5, lines 6-9 and page 9, lines 4-13. Claim 10 is dependent on claim 9 and should be clear for the same reasons.

13. The Examiner respectfully disagrees. While the fact that the plate includes the slot is clear from the instant application's specification, it is not clear how the plate fits in with the rest of the apparatus. Both the plate and the edge control element are referred to as element 15 and 15'. However, since the specification states that the plates (15 and 15') are provided with slots (154, 154'), it is not clear if the walls (of claim 1) are synonymous to the plates (of claims 9, 10, and 11) or if the edge control element is synonymous to the plates or if the edge control elements comprises plates in addition to walls.

14. The Applicant argues that the relationship between "disk" and the rest of apparatus is clear since claim 11 defines "...a disk including said slot..." where the slot is defined in claim 1. Thus, the structural connections including the disk are defined in the present claims. See for example, page 5, lines 14-16 and page 9, lines 10-13.

15. The Examiner respectfully disagrees. While it is clear from the instant application's specification that each plate includes a disk including the slot, it is not clear how the disk or the

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plate fit in with the rest of the apparatus. The disk is not described, except to state that the plate includes a disk which includes the slot, and the disk is not shown in the drawings.

16. Applicant's arguments with respect to the 35 U.S.C. 102 and 103 rejections filed on 29 September 2011 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YANA BELYAEV whose telephone number is (571)270-7662. The examiner can normally be reached on M-F 9 am- 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Daniels can be reached on (571) 272-2450. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Y. B./
Examiner, Art Unit 1741

/Matthew J. Daniels/
Supervisory Patent Examiner, Art Unit 1741